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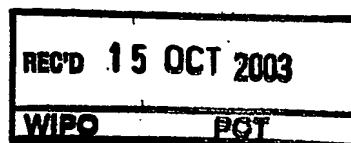
PATENT OFFICE  
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the documents attached hereto are true copies of the  
Forms P2, P6, provisional specification and drawings of  
South African Patent Application No. 2002/6345 in the  
name of M & S Technical Consultants & Services (Proprietary)  
Limited

Filed : 8 August 2002  
Entitled : Method of manufacturing a  
Framework having a honey-  
comb structure

Geteken te  
Signed at

PRETORIA

In die Republiek van Suid-Afrika, hierdie  
in the Republic of South Africa, this

19th

dag van  
day of

September 2003

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REPUBLIC OF SOUTH AFRICA  
PATENTS ACT, 1978  
**APPLICATION FOR A PATENT**  
AND ACKNOWLEDGEMENT OF RECEIPT 08.08.02  
(Section 30 (1) - Regulation 22)

R 006000

HASR 711

The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

INRO/STY  
REPUBLIC VAN SUID AFRIKA  
S & F REFERENCE

OFFICIAL APPLICATION NO.

21 01 **2002/ 6345**

PA133482/P

FULL NAME(S) OF APPLICANT(S)

71 M&S TECHNICAL CONSULTANTS & SERVICES (PROPRIETARY) LIMITED

ADDRESS(ES) OF APPLICANT(S)

PLOT 40 DAWN FARM DRIEFONTEIN, MULDERSDRIFT, 1747, GAUTENG, SOUTH AFRICA

TITLE OF INVENTION

54 METHOD OF MANUFACTURING A FRAMEWORK HAVING A HONEYCOMB STRUCTURE

THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. THE EARLIEST PRIORITY CLAIM IS:

COUNTRY: NIL NUMBER: NIL DATE: NIL

THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.

21 01

THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND IS BASED ON APPLICATION NO.

21 01

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1. A single copy of a provisional specification of 10 pages.
- ☒ 2. Drawings of 3 sheets.
- ☐ 3. Publication particulars and abstract (Form P.8 in duplicate).
- ☐ 4. A copy of Figure of the drawings (if any) for the abstract.
- ☐ 5. Assignment of invention.
- ☐ 6. Certified priority document.
- ☐ 7. Translation of the priority document.
- ☐ 8. Assignment of priority rights.
- ☐ 9. A copy of the Form P.2 and the specification of S.A. Patent Application No.
- ☐ 10. Declaration and power of attorney on Form P.3.
- ☐ 11. Request for ante-dating on Form P.4.
- ☐ 12. Request for classification on Form P.9.
- ☒ 13. Form P.2 in duplicate.
- ☐ 14. Other.

74 ADDRESS FOR SERVICE: SPOOR & FISHER, SANDTON

Dated: 8 August 2002

*AM Dye*

SPOOR & FISHER  
PATENT ATTORNEYS FOR THE APPLICANT(S)

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TRADE MARKS AND COPYRIGHT

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2002

REGISTRATEUR VAN PATENTE, MODELLE  
HANDELSMERKE EN OUTEURSREG

REGISTRAR OF PATENTS

REPUBLIC OF SOUTH AFRICA		REGISTER OF PATENTS		PATENTS ACT, 1978		
OFFICIAL APPLICATION		LODGING DATE: PROVISIONAL		ACCEPTANCE DATE		
21	01 2002/6345	22	8 AUG 2002	47		
INTERNATIONAL CLASSIFICATION		LODGING DATE: COMPLETE		GRANTED DATE		
51		23				
FULL NAME(S) OF APPLICANT(S)/PATENTEE(S)						
71	M&S TECHNICAL CONSULTANTS & SERVICES (PROPRIETARY) LIMITED					
APPLICANTS SUBSTITUTED:				DATE REGISTERED		
71						
ASSIGNEE(S)				DATE REGISTERED		
71						
FULL NAME(S) OF INVENTOR(S)						
72	HALL, ALETHEA ROSALIND MELANIE					
PRIORITY CLAIMED		COUNTRY		NUMBER		
N.B. Use International abbreviation for country (see Schedule 4)		33	NIL	31	NIL	
				32	NIL	
TITLE OF INVENTION						
54	METHOD OF MANUFACTURING A FRAMEWORK HAVING A HONEYCOMB STRUCTURE					
ADDRESS OF APPLICANT(S)/PATENTEE(S)						
PLOT 40 DAWN FARM DRIEFONTEIN, MULDERSDRIFT, 1747, GAUTENG, SOUTH AFRICA						
ADDRESS FOR SERVICE				S & F REF		
74	SPOOR & FISHER, SANDTON			PA133482/P		
PATENT OF ADDITION NO.			DATE OF ANY CHANGE			
61						
FRESH APPLICATION BASED ON			DATE OF ANY CHANGE			

REPUBLIC OF SOUTH AFRICA  
PATENTS ACT, 1978

## PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO.

LODGING DATE

21	01	2002/6345
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22	8 AUGUST 2002
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## FULL NAMES OF APPLICANTS

71	M&S TECHNICAL CONSULTANTS & SERVICES (PROPRIETARY) LIMITED
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## FULL NAMES OF INVENTORS

72	HALL, ALETHEA ROSALIND MELANIE
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## TITLE OF INVENTION

54	METHOD OF MANUFACTURING A FRAMEWORK HAVING A HONEYCOMB STRUCTURE
----	--

**BACKGROUND OF THE INVENTION**

This invention relates to a method of manufacturing a framework having a honeycomb structure with a plurality of compartments running the length of the framework from a first end to a second end, for use, for example, in the construction of a structure such as a mine support, a dam wall or an artificial reef unit or the like, where at least some of the compartments are closed at at least one end.

It is well known to form support structures such as roadways, canals or river or bank linings, mine supports and artificial reef units from a material having an open honeycomb structure, i.e. having a plurality of compartments or cells divided by dividing walls, each compartment or cell being filled with a suitable filler material. Examples of such materials having an open honeycomb structure for use in these support structures are Hyson-Cells from M & S Technical Consultants & Services (Pty) Limited, Geoweb from Presto Products Company, Tenweb from Tenax Corp, Armater from Crow Company, Terracell

from Webtech Inc, Envirogrid from Akzo Nobel Geosynthetics Co, and Geocells from Kaytech.

It is also known how to manufacture such materials having an open honeycomb structure. An example is illustrated in US Patent No 4,478,659 to A R M Hall.

### **SUMMARY OF THE INVENTION**

According to a first aspect of the invention there is provided a method of manufacturing a framework having a honeycomb structure with a plurality of compartments running the length of the framework from a first end to a second end thereof, with at least some of the compartments being closed at the first end or at the second end or at both ends of the framework, from a plurality of sheets of a plastics material, including the steps of:

joining a first sheet to a second sheet along a plurality of join lines to form a first row of compartments,

joining a third sheet to the second sheet along a plurality of join lines intermediate the join lines between the first and second sheets to form a second row of compartments,

joining a fourth sheet to the third sheet along a plurality of join lines in register with the join lines between the first and second sheets to form a third row of compartments,

and so on to form the honeycomb structure, and

closing at least some of the compartments at the first end of the framework or at the second end of the framework or at both ends of the framework.

When it is desired to close some or all of the compartments at the first end of the framework, the closure step preferably comprises:

-3-

providing a skirt depending from an edge of each sheet at the first end of the framework and either joining the skirt on the first sheet to the second sheet to close the first row of compartments, joining the skirt on the second sheet to the third sheet to close the second row of compartments and so on; or joining the skirt on the first sheet to the skirt on the second sheet to close the first row of compartments, joining the skirt on the third sheet to the skirt on the fourth sheet to close the third row of compartments, and so on.

Alternatively, when it is desired to close all of the compartments at the first end of the framework, the closure step preferably comprises:

providing a skirt depending from an edge of the first sheet and a skirt depending from an edge of the last sheet at the first end of the framework, providing two skirts depending from an edge of every sheet intermediate the first and the last sheets at the first end of the framework, joining the skirt on the first sheet to an adjacent skirt on the second sheet to close the first row of compartments, joining adjacent skirts on the second and third sheets together to close the second row of compartments, joining adjacent skirts on the third and fourth sheets together to close the third row of compartments, and so on.

If desired, certain of the skirts may be omitted so as to leave certain of the compartments open with others being closed.

The same procedure may be repeated at the second end of the framework to close some or all of the compartments at the second end of the framework as well.

The method of joining the sheets together along join lines, as well as the method of closing at least some of the compartments at the first end of the framework or at the second end of the framework or at both ends of the framework may be any suitable method such as for example heat or ultrasonic

welding, sewing, or gluing or the like. As the sheets are made of a plastics material, the preferred method of joining is heat welding or ultrasonic welding.

According to a second aspect of the invention there is provided a framework having a honeycomb structure with a plurality of compartments running the length of the framework from a first end to a second end with at least some of the compartments being closed at the first end or at the second end or both of the framework, the framework being manufactured from a plurality of sheets of a plastics material.

The framework of the invention may be used in the manufacture of various structures including mine supports, dam walls, storage packs, artificial reef units and the like.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

- Figure 1** is a perspective view of a plurality of sheets of a plastics material prior to being joined to one another to form a framework of the invention;
- Figure 2** is a perspective view of a framework formed from the sheets of Figure 1, prior to closure of some or all of the compartments at a first end or a second end of the framework;
- Figure 3** is a view along the arrow A of the framework of Figure 2;
- Figure 4** is a view along the arrow B of the framework of Figure 2;
- Figure 5** is a schematic view of a first method of closure of some or all of the compartments of the framework of Figure 2;
- Figure 6** is a schematic view of a second method of closure of some or all of the compartments of the framework of Figure 2;
- Figure 7** is a schematic view of a third method of closure of some of the compartments of the framework of Figure 2; and



**Figure 8** is a schematic view of the closure of some or all of the compartments at both ends of the framework of Figure 2.

### **DESCRIPTION OF EMBODIMENTS**

The crux of the invention is that a framework having a honeycomb structure with a plurality of compartments running the length of the framework from a first end to a second end, which is manufactured from a plurality of sheets of a plastics material, has some of the compartments closed at the first end or at the second end or at both ends of the framework.

The closure of some or all of the compartments allows material filled into the compartments to be contained therein, for various purposes.

The method of manufacture of the framework of the invention will now be described with reference to the accompanying drawings.

Referring to Figure 1, there is provided a plurality of sheets 10 of a plastics material.

Referring to Figures 2 to 4, a framework 12 having a first end 14 and a second end 16 is formed from the plurality of sheets 10 as follows.

A first sheet 10A is joined to a second sheet 10B along a plurality of join lines 18 which are generally substantially parallel, to form a first row of compartments 20. It can be seen that the join lines 18 stop short of one of the ends of the sheets 10A, 10B so as to leave a skirt 22A depending from the sheet 10A and similarly a skirt 22B depending from the sheet 10B.

Thereafter, a third sheet 10C is joined to the second sheet 10B along a plurality of join lines 24 which again are generally substantially parallel, and which are intermediate the join lines 18, to form a second row of compartments 26. Again the join lines 24 stop short of one of the ends of the sheet 10B, 10C so as to leave a skirt 22C depending from the third sheet 10C.

Thereafter, a fourth sheet 10D is joined to the third sheet 10C along a plurality of join lines 28 which again are generally substantially parallel, and which are in register with the join lines 18, to form a third row of compartments 30. Again the join lines 28 stop short of one of the ends of the sheets 10C, 10D so as to leave a skirt 22D depending from the fourth sheet 10D.

This process is continued to form the framework 12.

The join lines 18, 24, 28, etc., may be formed in any suitable manner, preferably by heat or ultrasonic welding.

The next step is to close some or all of the rows of compartments 20, 26, 30, etc., at the second end 16 of the framework 12.

A first method of closing some or all of the compartments is illustrated in Figure 5. The skirt 22A depending from the sheet 10A is folded over and joined to the sheet 10B at the end of the join lines 18 between the sheets 10A and 10B so as to close the row of compartments 20 at the second end 16 of the framework 12. Likewise the skirt 22B depending from the sheet 10B is folded over and joined to the sheet 10C at the end of the join lines 24 between the sheets 10B and 10C so as to close the row of the compartments 26. In a similar manner the skirt 22C is joined to the sheet 10D and the skirt 22D is joined to the sheet 10E to close the row of compartments in the various rows in the framework 12. In this way, all of the rows of compartments 20, 26, 30, etc., in the framework 12 are closed at the second end 16 of the framework 12.

It is to be noted that the compartments in a row are in communication with each other, e.g all the compartments 20 are in communication with each other, but not in communication with the compartments 26, 30 etc in other rows.

If desired, the join lines 18, 24, 28 may then be extended so as to close each compartment 20, 26, 30 from adjacent compartments 20, 26, 30 in the same row.

Thus, any material filled into the compartments 20, 26, 30, etc., contained in the compartments 20, 26, 30, etc., by virtue of the closure of these compartments 20, 26, 30, etc., of the framework 12.

The joining of the skirts 22A, 22B, etc., to the adjacent sheets 10B, 10C, etc., may be achieved in the same manner as the formation of the join lines 18, 24, 28, preferably by heat or ultrasonic welding.

Referring to Figure 6, a second method of closure of some or all of the compartments 20, 26, 30 in the framework 12, is illustrated. Firstly, additional skirts 32 are joined to the sheets 10B, 10C and in fact all sheets intermediate the first sheet 10A and the last sheet of the framework 12 so that each intermediate sheet 10B, 10C, etc., has two skirts 22, 32 depending therefrom.

Thereafter, the skirt 22A on the sheet 10A is joined to the skirt 22B on the sheet 10B at 34 to close the row of compartments 20. The skirt 32B attached to the sheet 10B is joined to the skirt 32C attached to the sheet 10C at 34 to close the row of compartments 26. Thereafter the skirt 22C on the sheet 10C is joined to the skirt 22D on the sheet 10D at 34 to close the row of compartments 30. This process is continued until some or all of the rows of compartments 20, 26, 30, etc., in the framework 12 are closed at the second end 16 of the framework 12. Again, in a similar way to that described above, each compartment in a row may be closed off from adjacent compartments in

the same row. Again, the skirts 22, 32 may be joined to one another by means of heat or ultrasonic welding.

Referring to Figure 7, a third method of closure of some or all of the compartments 20, 26, 30 in the framework 12, is illustrated. The skirt 22A on the sheet 10A is joined to the skirt 22B on the sheet 10B at 36 to close the row of compartments 20. The skirt 22C on the sheet 10C and the skirt 22D on the sheet 10D are joined at 36 to close the row of compartments 30. The second row of compartments 26 and every second row thereafter are left open.

As indicated above, it is possible to close some or all of the rows of compartments at both ends 14, 16 of the framework 12. This is specifically illustrated in Figure 8 where all of the rows of compartments are closed, in the same manner as illustrated in Figure 6.

When some or all of the rows of compartments at one end of the framework are closed, particularly the end of the framework intended to rest on a base in use, the compartments may be filled with a material which is then retained in the closed compartments. This may assist in the formation of structures such as dam walls or artificial reef units.

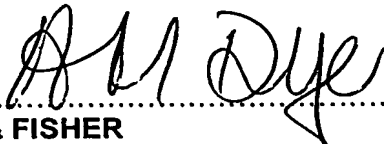
When all of the rows of compartments are closed at both ends of the framework so that the framework is in essence sealed, a material may be filled into the compartments through suitable openings. In addition the framework may then be pressurized by introducing a fluid or fluidized solid under pressure into the framework, which may be useful where the framework is being used in the manufacture of a mine support.

The closure of compartments may also assist where it is intended to stack frameworks one on top of another.

A first framework may be attached to a second similar framework to build a larger structure. For example a first end of a first framework 12 as illustrated in Figure 8 may be attached to a second end of a second framework 12 as illustrated in Figure 8, e.g by heat or ultrasonic welding.

It is also possible to form a plurality of holes in the framework, or in an extension or extensions to the framework, so that flexible stays or rigid rods or the like may be inserted through the holes to anchor the framework in position in use.

Dated this 8th day of August 2002



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**SPOOR & FISHER**  
**APPLICANT'S PATENT ATTORNEYS**

FIG 1

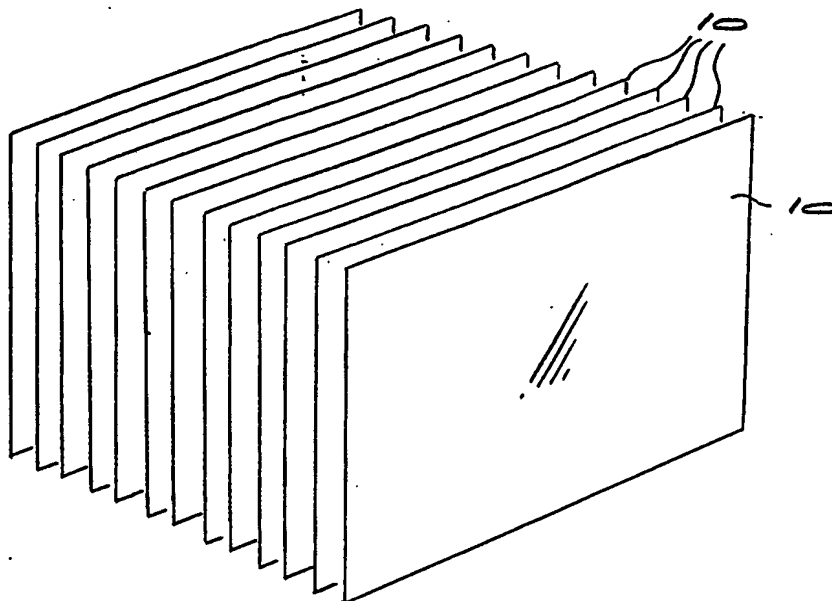
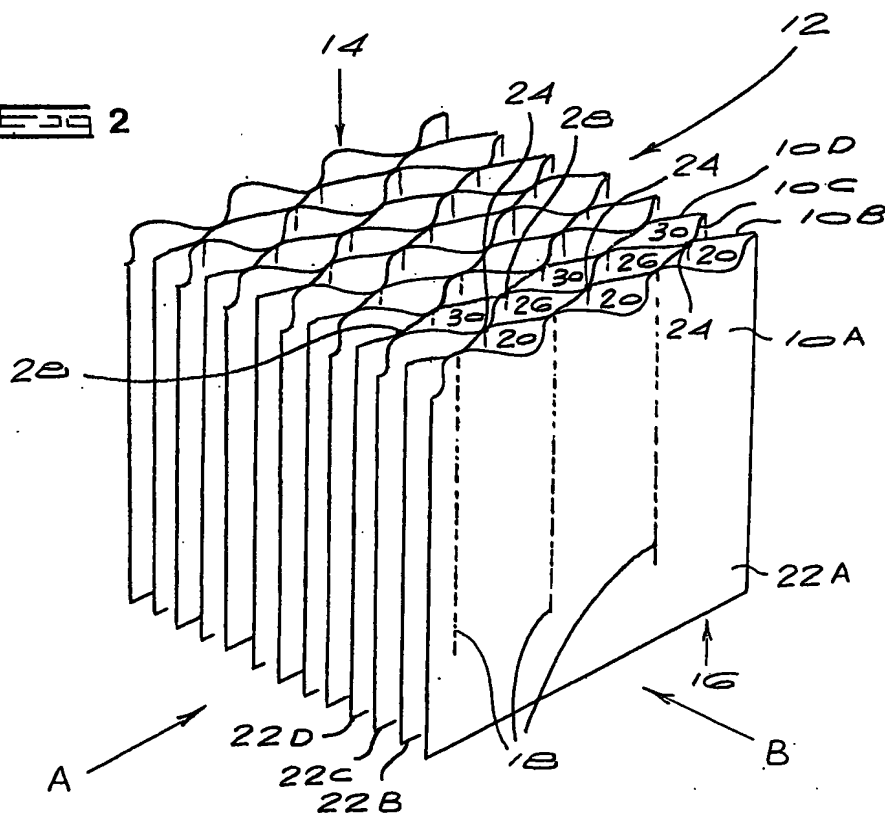


FIG 2



*AM Dye*

SPOOR & FISHER  
Applicant's Patent Attorneys

FIG 3

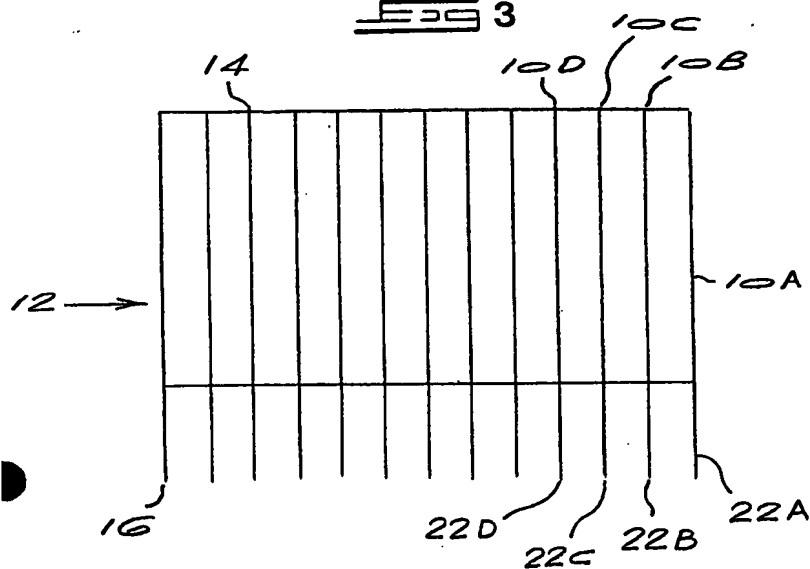


FIG 4

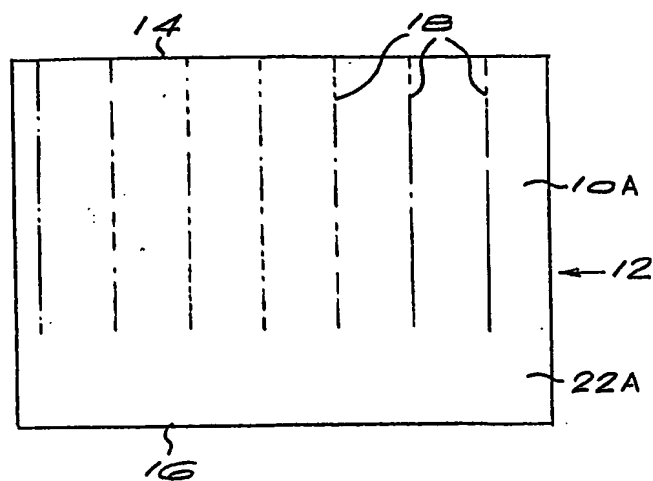


FIG 5

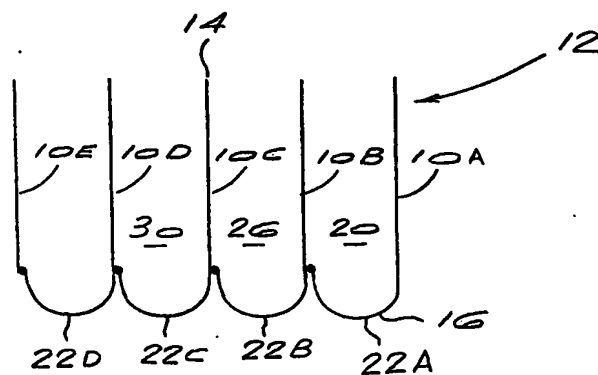
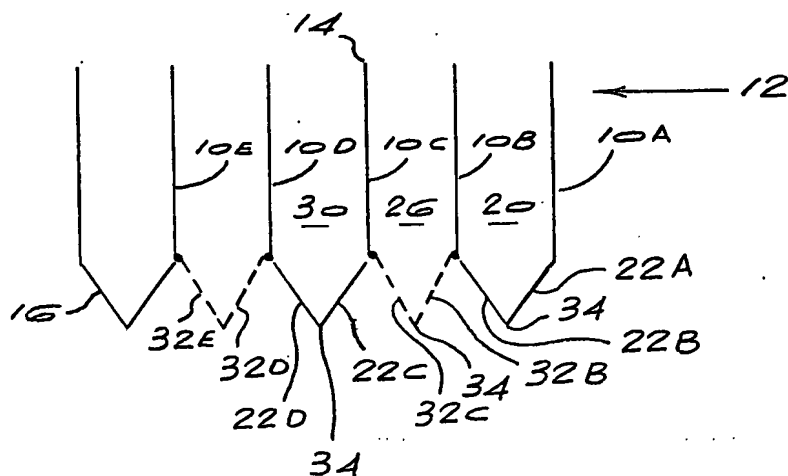
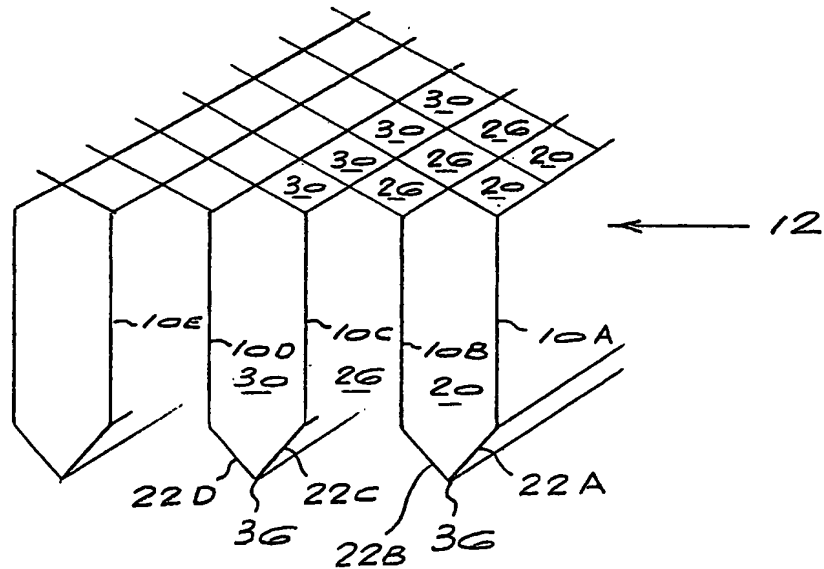


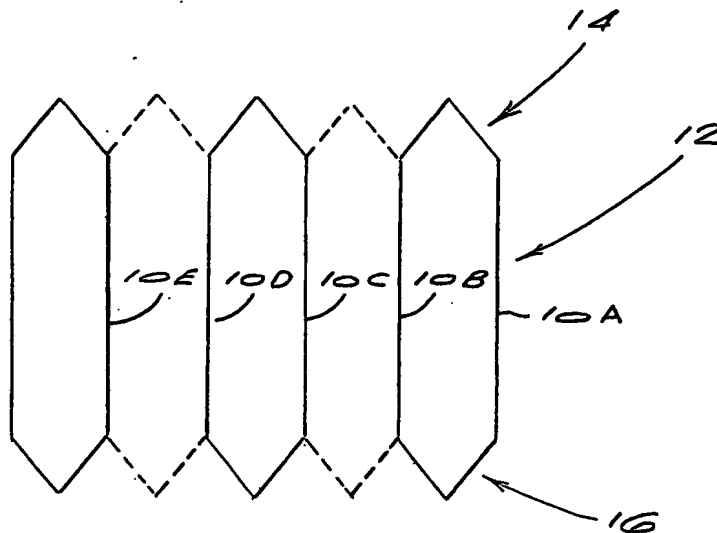
FIG 6



**FSG 7**



**SS 8**





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